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U. S. DEPARTMENT OF AGRICULTURE.

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE OHIO AGRICULTURAL EXPERIMENT STATION,
CHARLES E. THORNE, DIRECTOR; GEORGE N. COFFEY,
IN CHARGE SOIL SURVEY.

SOIL SURVEY OF STARK COUNTY, OHIO.

BY

CHARLES N. MOONEY, OF THE U. S. DEPARTMENT OF AGRICULTURE, AND H. FOLEY TUTTLE AND A. BONAZZI, OF THE OHIO AGRICULTURAL EXPERIMENT STATION.

W. E. McLENDON, INSPECTOR, NORTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1913.]

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1915.

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Soils,
Washington, D. C., August 26, 1914.

Sir: In the extension of the soil survey in the State of Ohio work was undertaken in Stark County during the field season of 1913. This was done in cooperation with the Ohio Agricultural Experiment Station, and the selection of the area was made after conference with State officials.

I have the honor to transmit herewith the manuscript report and map covering this area, and to recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1913, as provided by law.

Respectfully,

Milton Whitney,
Chief of Bureau.

Hon. D. F. Houston,
Secretary of Agriculture.

CONTENTS

Soil Survey of Stark County, Ohio. By Charles N. Mooney, of the U. S. Department of Agriculture, and H. Foley Tuttle and A. Bonazzi, of the Ohio Agricultural Experiment Station ..... Page. 5
Description of the area 5
Climate 8
Agriculture 9
Soils 13
Volusia series 15
Volusia silt loam 15
Volusia clay loam 17
Volusia silty clay loam 18
Volusia gravelly clay loam 20
Volusia loam 21
Wooster series 22
Wooster silt loam 22
Wooster loam 24
Wooster gravelly loam 25
Wooster sandy loam 27
Dekalb series 27
Dekalb silt loam 28
Dekalb sandy loam 29
Holston series 29
Holston silt loam 30
Chenango series 30
Chenango gravelly loam 31
Chenango silt loam 32
Chenango sandy loam 33
Huntington series 34
Huntington silt loam 34
Holly series 35
Holly clay loam 35
Papakating series 36
Papakating clay loam 36
Miscellaneous material 37
Muck and Peat 37
Summary 38

ILLUSTRATIONS.

FIGURE.

Page.
Fig. 1. Sketch map showing location of the Stark County area, Ohio 5

MAP.

Soil map, Stark County sheet, Ohio.

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SOIL SURVEY OF STARK COUNTY, OHIO.

By CHARLES N. MOONEY, of the U. S. Department of Agriculture, and H. FOLEY TUTTLE and A. BONAZZI, of the Ohio Agricultural Experiment Station.

DESCRIPTION OF THE AREA.

Stark County is situated in northeastern Ohio. Two counties lie between it and Lake Erie and one between it and the Pennsylvania line. By rail Canton, the county seat, is 55 miles south of Cleveland and about 103 miles west of Pittsburgh. The county is bounded on the north by Summit and Portage, on the east by Mahoning and Columbiana, on the south by Carroll and Tuscarawas, and on the west by Wayne and Holmes Counties. It comprises an area of 580 square miles, or 371,200 acres.

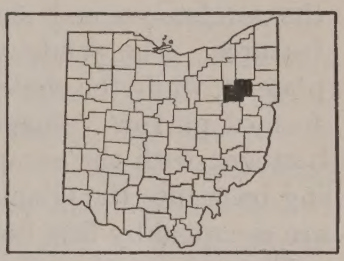

FIG. 1.—Sketch map showing location of the Stark County area, Ohio.

Topographically the county lies just south of the crest of the divide or watershed between Lake Erie and the Ohio River, and thus entirely within the Ohio River drainage basin. This is a plateau region, with an average elevation of 1,100 to 1,200 feet, with the main stream valleys about 200 feet lower. There is a slight rise to the north, and in the eastern part of the county, on the divide between the Tuscarawas and Mahoning Rivers, the broad ridge crests attain an elevation of slighty more than 1,300 feet above sea level. The lowest point is where the Tuscarawas River leaves the county at the south-central boundary. This is just below the 900-foot contour. There is thus a range of slightly more than 400 feet between the highest and lowest points within the county.

The region is composed of sedimentary rocks of Carboniferous age, predominantly sandstones and shales, with interstratified beds of limestone, fire clay, and coal, the latter in lenses rather than in continuous beds. These where laid down in water were originally horizontal, but later were thrown into broad, gentle folds. The work of erosion prior to the Glacial period was active and the plateau was dissected. Wide troughlike valleys were carved out by the

main streams, and indications are that the drainage was to the north instead of to the south as now. During the Glacial period the ice sheet advanced into the region, not quite covering the whole county. The south line of glaciation reaches to the extreme southwest corner of the county, follows east along the county line to the Tuscarawas River, and then northeast to North Industry, the line of demarcation being rather regular and abrupt, but from North Industry through Osnaburg and Paris Townships the line is very irregular.

The glaciated and nonglaciated sections show a marked contrast in topography. The latter constitutes the rougher and more hilly section of the county. The general level of 1,200 feet is maintained on the summits of the ridges. It has been much dissected by stream erosion. The main creek courses open to the south, while the short tributaries and runs flow into them at right angles, resulting in a network of streams cutting into the uplands. Thus there have been formed as interstream areas narrow, irregular ridge tops, with narrow, irregular spurs extending at right angles to the main ridges and between the smaller streams.

The varying degrees of hardness and resistance to weathering of the sandstones and shales have determined the main topographic features. The sandstones, being more resistant, have held up the plateau, while the shales, weathering and eroding more rapidly, have formed narrow V-shaped valleys, with scarcely any valley floors or bottoms, with the exception of forks of Sandy Creek, which, reaching back into the Glacial section, have carved out larger valleys and are occupied by first bottoms and terraces rising from them.

The topography of the glaciated section of the county is rolling to hilly, the southern part adjoining the nonglaciated portion being the more steeply hilly, but the slopes are smooth and the hilltops rounded. Through the north-central part of the county there is a morainic belt where the topography is much broken by low, rounded, gravelly hills. West of the Tuscarawas River the hills rise boldly from the river, but at upper levels the topography becomes rolling. The eastern part of the county attains the highest elevations, but the surface consists of broad, dome-shaped divides with long, smooth slopes, the general appearance being that of a gently undulating to rolling country. The larger valleys are wide and troughlike, with first bottoms or flood plains along the streams and higher, flat terraces rising above them.

The drainage of the county is effected by the Tuscarawas and Mahoning Rivers. The Tuscarawas, with its tributary creeks, drains fully four-fifths of the county, including all of the western, central, and southern parts.

The Mahoning River receives only a small part of the drainage of the county—that of the northeast section.

Settlement of the region which embraces Stark County began in 1805 in the vicinity of the present sites of Canton and Osnaburg. In this year Canton was laid out. There were also a number of settlements made in 1806 over a considerable part of the territory included in the present limits of the county. The settlement of Massillon took place a few years later, while that of Alliance was started after the completion of the railroad through the county or about 1851. The county was organized in 1809.

The earliest settlers were from Pennsylvania, Maryland, and Virginia, being followed in a short time by others from New England. These were all of English descent. Some years later Germans from Pennsylvania settled on farm lands, and later still German immigrants came in considerable numbers. At the present time a large proportion of the population of the county, especially in the rural districts, is of German descent.

With the development of coal mining and manufacturing there has been an influx of foreigners of different nationalities. These swell the population of the towns and cities, affecting the rural population very little. According to the census, the population of the county was 64,031 in 1880, 84,170 in 1890, 94,747 in 1900, and 122,987 in 1910.

The rural population is well distributed throughout the county and represents about one-third of the total population. According to the census of 1910, Canton, the county seat, has a population of 50,217. It is an important manufacturing and railroad center. Massillon is next in importance in manufacturing and number of railroads, and has a population of 13,879. Alliance is an important railroad junction city in the northeastern part of the county, with a population of 15,083. Minerva, Waynesburg, Navarre, Canal Fulton, Louisville, New Berlin, and Beach City are important towns in different parts of the county. There are a number of small towns along the railroads and some good-sized villages on the ridge tops, where they were located before the days of the railroad. Most of the towns along the railroads owe their existence and growth to the development of the clay-working industry, where shales and fire clay suitable for the manufacture of vitrified paving and building blocks and sewer pipes are found in the valley walls. There are also some coal mines and stone quarries.

Stark County is exceptionally well supplied with transportation facilities, railroads traversing it in all directions. These follow the stream valleys. Lines of the Pittsburg, Fort Wayne & Chicago, a

part of the Pennsylvania System; the Wheeling & Lake Erie; the Baltimore & Ohio, and the Lake Erie, Alliance & Wheeling, a part of the New York Central system, pass through the county. In addition to the steam roads, there are a number of electric roads connecting important towns.

The wagon roads are numerous, and most of them follow section lines in the smoother parts of the county. Those in rougher parts follow valleys and ridge tops and are located, especially the main ones, with reference to grades. Reaching out from different towns are some roads paved with brick, and there are also sections of roads throughout the county that are surfaced either with stone or gravel.

The products of the farms and gardens find a good market in the towns and cities within the county.

The rural free delivery of mail reaches all sections, and rural telephone lines are in general use throughout the county.

CLIMATE.

The following table, compiled from the Weather Bureau records gives the normal monthly, seasonal, and annual temperature and precipitation at Canton. The mean annual temperature is 49.6° F. The summer mean is 70.1°, and during the five months from May to September hot spells occur when the temperature rises above 90°. These are usually attended by high relative humidity. A maximum temperature of 99° F. has been recorded in July.

The winters are moderately cold, the mean for the winter months being 28.3°. From the latter part of November to March the temperature, however, frequently falls below zero. In February, when the coldest spells generally occur, an absolute minimum of —20° F. has been recorded, while —18° has been recorded in January. As a rule, the grain and grass crops are covered during these cold spells by a protecting blanket of snow.

Frosts occur occasionally at unseasonable times, particularly in the spring, causing injury to fruit and other crops. The growing season, however, is nearly always of sufficient length to mature all crops. The table shows the average and actual dates of the last killing frost in the spring and the first in the fall.

The mean annual precipitation of 39.16 inches is well distributed throughout the year, being greatest during the summer months, when most needed for growing crops. Droughts sometimes occur, however, resulting in decreased yields. The annual mean depth of snowfall is 38.1 inches.

Normal monthly, seasonal, and annual temperature and precipitation at Canton.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	°F.	°F.	°F.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
December	31.0	67	—11	2.76	2.68	1.91	7.5
January	27.0	71	—18	2.92	1.61	3.94	9.7
February	26.9	69	—20	2.98	2.30	6.17	8.0
Winter	28.3			8.66	6.59	12.02	25.2
March	36.5	78	— 7	3.31	2.23	3.73	5.6
April	48.1	88	17	3.13	2.40	3.87	4.2
May	59.7	94	28	3.99	6.09	7.99	.3
Spring	48.1			10.43	10.72	15.59	10.1
June	68.6	98	38	4.25	1.74	2.21	T.
July	72.2	99	44	4.77	2.50	2.15	.0
August	69.6	96	42	3.34	.33	6.16	.0
Summer	70.1			12.36	4.57	10.52	T.
September	64.0	93	30	2.85	4.35	6.88	T.
October	51.5	88	18	2.23	1.88	6.58	.1
November	39.9	75	0	2.63	3.18	2.43	2.7
Fall	51.8			7.71	9.41	15.89	2.8
Year	49.6	99	—20	39.16	31.29	54.02	38.1

Average date of first killing frost in fall, Oct. 5; of last in spring, Apr. 27. Earliest date of killing frost in fall, Sept. 15; latest in spring, May 21.

AGRICULTURE.

Beginning in 1805, when the lands were opened for entry, there was a general movement of settlers from the States east of the Alleghenies to this frontier country, and within a few years homesteads were taken up over nearly all this part of Ohio. These early settlers found merely trails to follow, coming in either on foot, on horseback, or in wagons. Upon locating their homesteads the clearing of the land and its cultivation to the staple field crops and to garden vegetables was immediately begun.

It is said that the lands in the valleys were taken up first because they were nearer to water and also more easily tilled. The system of agriculture followed was necessarily of the self-sustaining type, Cleveland at that time being only a small settlement, while Pittsburgh, the nearest market, was about 100 miles away.

As the clearings extended there was a surplus of products and prices were very low, wheat bringing as low as 25 cents a bushel.

Under these conditions agriculture came practically to a standstill beyond the production of what was needed for home consumption. In the meantime roads were opened between settlements and some main roads were constructed, following the important trails, but these did not afford sufficient relief. After 1820, while road building was at its height, water transportation was being considered, as commerce had started on Lake Erie. In 1825 the Ohio Legislature passed an act to construct a canal from Lake Erie to the Ohio River, and work was begun the following year and went rapidly forward, so that by 1830 the canal was open from Cleveland to Portsmouth, on the Ohio River. This afforded a cheap means of transportation, and an impetus was given to agriculture. The production of grain attained considerable proportions, and Massillon, on account of the great quantity of wheat handled there, became known as the "Wheat City." Stock raising also became an important industry, and improved breeds of farm stock were imported. There was also an increase in the production of staple crops. Agriculture was thus put on a prosperous basis, and by 1850 most of the land in the county was taken up and farmed.

After 1850 the era of railroad building began, the Pittsburg, Fort Wayne & Chicago trunk line west of Pittsburgh being completed through the county by 1851. This gave a further impetus to agriculture. As the railroad facilities increased, the use of the canal gradually decreased, until it was finally abandoned some years ago. As the trunk lines of railroads extended west new lands were opened up with which this section could not compete in the production of grains, owing to the greater productiveness of the virgin soils. Thus, a setback was given to agriculture in this region, but the farmers gradually adjusted themselves to the changed conditions and a more diversified system of farming was evolved, in which general farming, with more attention to stock raising and dairying, was taken up. The common practice now on all soils except the Muck and Peat consists of general farming, in conjunction with dairying and some stock raising and feeding. The small grains are usually grown in rotation, a considerable part of the farm being kept in grass for hay and pasturage.

Wheat has always been an important crop in the county, and, together with grass for hay and pasturage, leads all other crops in acreage. It forms one of the main crops in the rotation. According to the census, 56,942 acres were devoted to wheat in 1879, 53,771 acres in 1889, 54,682 acres in 1899, and 44,759 acres in 1909.

Timothy and clover are the main hay crops. Some small alfalfa fields were also seen, but these have not been established long enough to determine the advisability of extending the acreage. Timothy and

clover are usually sown together. From 24,577 acres sown in 1909 the production was 31,967 tons. Of timothy alone 39,840 tons were produced from 32,672 acres. Considerable clover, however, is sown alone, especially on dairy farms, and where the object is to get more benefit from the leguminous crop.

Corn and oats are important crops in the general rotation, the aggregate acreage of the two slightly exceeding that in wheat. The last census gives the acreage planted to corn in 1909 as 35,400, and to oats as 34,921, producing, respectively, 1,483,957 and 1,262,970 bushels. In the same year 380 acres were devoted to rye, 55 acres to buckwheat, and 24 acres to barley.

Potatoes are grown on every farm for home use, and also form one of the commercial crops, especially on the gravelly uplands and the terrace soils. In 1909 there were 6,774 acres devoted to this crop, producing 719,680 bushels.

The dairy stock on the farms generally consists of common-grade animals, with Jersey and Holstein strains predominating. A great deal of milk and cream are produced and shipped to the manufacturing towns within the county and to Cleveland. There are also a few creameries and cheese factories operating in the county. Of beef cattle the Hereford and Shorthorn breeds or grades are raised. The fat cattle are sold to local markets. Feeders, or range cattle, bought at Chicago, are finished on the farms and shipped out again.

The breeding of horses and Shetland ponies is also carried on to some extent.

There is a considerable acreage of Muck and Peat lands in the central and northern parts of the county which, wherever drained and put under cultivation, are devoted to truck crops, including celery and onions, the former being the most important crop. The largest acreages in these two crops are in the bog east of Hartville. Most of the bogs north of Massillon and Canton are also devoted to trucking, including a variety of vegetables. The celery crop is planted so as to come into market from early in the fall to the latter part of November. The first transplantings are made early in July and continue into August. The Giant Pascal and Golden Self-blanching are the varieties commonly planted. The celery grows large, and is of excellent quality. Some of it is sold on the local markets and some is shipped to such places as can be reached directly by the railroads of the county, of which Pittsburgh and Wheeling are the most important.

Usually it requires two or three years to bring the Muck and Peat bogs into a productive condition. They must be thoroughly drained first. Lime is then applied to sweeten the soil. Irish potatoes and sweet potatoes are usually grown at first, but if the season is favor-

able even celery can be planted the first year on the better areas. Intensive cultivation is given all the truck crops grown, and much hand labor is required, especially in the weeding.

Fruit is not grown to a large extent, although there are some fruit trees on most farms. There are some commercial peach orchards on the gravelly soils and the sandy soils south of Osnaburg. Strawberries, raspberries, and blackberries are grown in a few places for market. Apples succeed on most of the soils of the county, especially where the location is suitable, although few are grown. The Wooster and Dekalb and some of the Volusia types are especially suited to this crop.

A five-year rotation, consisting of corn, oats, wheat, timothy, and clover, is generally followed throughout the county with but little variation. The corn follows the clover or sod plowed under. Timothy or clover is sometimes planted alone, in which case the land is usually pastured the second year, and in some cases longer.

Barnyard manure when available is used on both corn and wheat, being applied to the latter as a top dressing. It is also used as a top dressing on grass. Commercial fertilizers are applied to corn and small grains, the usual application ranging from 100 to 200 pounds per acre. Fertilizer mixtures analyzing 2–8–2 and 2–8–4 are used, the latter being generally preferred. Bone meal is quite frequently used on wheat; also acid phosphate alone. Liming is quite common, the lime being applied to the plowed land at the rate of 200 to 500 pounds per acre, with a spreader or before the wheat is planted. Occasionally larger applications are made. Some farmers apply the lime with every wheat crop; that is, every five years. Truck farmers use considerable commercial fertilizers with barnyard manure. The quantity of fertilizers used varies considerably, but very few farmers apply more than 1,000 pounds to the acre. The fertilizers used are special brands or formulas put out by fertilizer companies for the particular crops and are high in potash. Common salt is used by some growers on the celery fields.

Improved farm machinery is generally employed on all farms.

Practically all the land suitable for cultivation has been cleared and utilized for farming. The acreage in farms has varied but little, as shown by the figures for the last five census periods. According to the last census, there were 335,382 acres in farms, of which 275,214 acres were improved. The average size of the farms was 69.1 acres, which shows but a slight decrease in size during the past 40 years, the average size of farms in 1880 having been reported as 83 acres. The percentage of farms operated by the owners as shown by the census of 1910 was 72.5.

Land is usually rented on a share basis, and to less extent for cash, according to conditions. When rented on shares the usual

agreement is for the tenant to furnish two-thirds and the owner one-third of the seed and fertilizers and to divide the crop equally. Considerable areas of Muck and Peat lands are rented for trucking.

Farm laborers are scarce but efficient, and the wages are usually about the same as those paid laborers on public works. During harvesting seasons the wages are higher.

The value of the farm lands is comparatively high, ranging from $30 to $100 an acre for the hilly lands in the southern part of the county to $100 to $200 an acre for the better lands in the smoother glaciated section of the county, and even higher near the larger towns. The Muck lands range from $75 to $150 an acre for the raw lands to $200 to $300 an acre for the improved lands. Near Canton and Massillon the price is much higher. These prices are for land alone, as very few buildings are found on the Muck or Peat. On the uplands and terraces the buildings and improvements affect the farm-land values.

As indicated by the general appearance of the farms and buildings, the farming class is as a whole thrifty and prosperous.

SOILS.

Nineteen types of soil, including Muck and Peat, were encountered in the survey of Stark County. These fall into three groups according to topographic position, namely, upland, terrace, and flood plain soils. According to origin, they also fall into three groups, viz, residual, glacial, and alluvial, and the second group may be divided further to show differences in the processes involved in the formation of the different soils or series of soils.

Stark County is a part of an elevated plateau region composed of alternating beds of sandstones and shales and to a less extent of limestone, fire clay, and coal beds, all of Carboniferous age. As laid down, the beds, being deposited in water, were in horizontal position, but they have been slightly folded and are now tilted at an angle to the surface. Erosive action of water has dissected the plateau deeply and carved out broad, troughlike valleys along the main streams and narrow V-shaped valleys on the smaller side streams. The weathering and erosion of these shales and sandstones have given rise to shallow soils with grayish to light-brown surface soils and pale to bright-yellow subsoils. These are the salient features of the Dekalb series.

According to geologists, the ice front advanced into this county a number of times during the glacial period, but the farthest advance, as indicated by the topography and the deposit of till, reached to the southwest corner, following along the southern boundary, but touching the hilltops only slightly if at all, to the Tuscarawas River,

then turning north and northeast to North Industry, the line of demarcation being rather sharp. Thence it passed to Paris and to the county line southeast of Paris, and along this section the boundary as indicated by the presence of glacial till is irregular.

As the ice advanced from the north it passed over in Ohio the same formations that are found in the county, the Carboniferous shales and sandstones. It scoured off the surface and ground the materials under its weight and shoved them along, and, upon its melting, these materials were left to fill or partially fill the valleys and to cover the smoother surface of the hills as a mantle of earth and stone of varying thickness. While much of the material is of near-by origin and in part local, the ice also brought in some material from the older geologic formations found to the north in Canada, gravel and bowlders of igneous and metamorphic crystallines, such as granite, gneiss, and some quartz being found upon the surface and disseminated through the soil mass. The glacial soils have been derived from this glacial till and may be separated as to mode of formation into two classes, according to whether derived from the till as laid down, or unmodified, or after it has been reworked and deposited by water, or modified. The former soils are found on the uplands and the latter as high terraces in stream valleys. There are 12 soil types of glacial origin included in 3 soil series. Nine types are formed from the unmodified glacial till and are found upon the upland. They belong in two soil series, the Volusia and Wooster.

The modified drift is found as terraces in the valleys of streams which rise in the glaciated region. These terraces extend along the streams into and through the nonglaciated section. It consists of débris that filled or partly filled the valleys and was reworked and deposited by the streams flowing out from the ice front. This material gives rise to the Chenango series of soils.

Along those streams of the county whose courses lie wholly within the unglaciated area the terraces are built of fine-grained material, so that their subsoils are free from gravel. A number of such terraces occur along the creeks in the southern part of the county. The soil formed from this finer material belongs in the Holston series.

The alluvial soils, including three types representing as many series, are found in the flood plains along the streams. They are low, flat, and poorly drained, constituting wet meadows. Of this, Holly is most extensive, followed by the Huntington and the Papakating. Besides these series types, accumulations mainly organic are found in the kettle holes, bogs, swamps, and former small lakes and along some of the streams. The depressed surface of such areas has resulted in poor drainage and swampy conditions, with the rank growth of vegetation, and this by its decay has given soils mapped as Muck and Peat.

This completes the list of soils viewed broadly in relation to the source of their materials and the manner of their formation. In following pages the series and types will be discussed in greater detail.

The following table gives the names and the actual and relative extent of the various soils mapped in Stark County:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Wooster silt loam	84,800	22.8	Volusia silty clay loam	7,424	2.0
Dekalb silt loam	52,416	14.1	Dekalb sandy loam	3,456	.9
Volusia silt loam	49,792	12.2	Papakating clay loam	3,456	.9
Wooster loam	45,184	13.4	Huntington silt loam	2,944	.8
Holly clay loam	28,736	7.8	Wooster sandy loam	2,176	.6
Volusia clay loam	21,888	5.9	Chenango sandy loam	832	.2
Wooster gravelly loam	20,288	5.5	Holston silt loam	768	.2
Volusia loam	18,048	4.9	Volusia gravelly clay loam	704	.2
Chenango silt loam	12,352	3.3			
Muck and Peat	8,384	2.3	Total	371,200	
Chenango gravelly loam	7,552	2.0			

Volusia Series.

The soils of the Volusia series have gray to brown surface soils underlain by mottled yellow and gray, plastic clayey subsoils. They are derived from the glacial deposits of eastern Ohio, southern New York, and northern Pennsylvania. In all cases the underlying shales and sandstones have given rise to practically all of the soil material, which has been modified to a slight degree by glacial material from other regions. The Volusia soils occupy the upland portion of the plateau country which slopes north and west from the Allegheny Mountains. In the higher, more easterly portions of the glaciated section of the plateau, deep preglacial erosion has cut the upland into rounded or flat-topped hills separated by deep, steep-sided gorges. Farther west, where the elevations are less, this topography is not so pronounced, the series occupying rolling hills divided by deep valleys.

VOLUSIA SILT LOAM.

The surface soil of the Volusia silt loam to an average depth of 8 inches consists of a brownish-gray silt loam with a smooth, soft feel. When moist the soil generally shows no plasticity, as it contains very little clay, but in a few locations there is clay enough to make it approach the heavier types in texture. The proportion of very fine sand in much of the type is sufficient to render it quite friable, and it is very similar to the Wooster silt loam. In such places

the soil also develops nearly as deep a brown color as the latter type. When dry, however, the surface soil has the characteristic gray or whitish appearance of soils of the Volusia series. The subsoil consists of a grayish or pale-yellow silt loam to a depth of a few inches, gradually merging into a silty clay loam, mottled yellow and gray to light drab, the mottling becoming more pronounced with depth. Usually at 18 to 24 inches there is a sort of hardpan in which gravel and sand are intermingled with the finer earthy material and some brownish iron crusts. The mottling persists, and the texture usually continues as a heavy silty clay loam, but frequently becomes more sandy or more clayey until it is a silty clay loam or clay, stiff, plastic, and with a smooth, greasy feel. Where the subsoil becomes heavier and clayey the drab mottling usually predominates. Frequently the subsoil continues throughout the soil profile of 36 inches as a silt loam somewhat heavier than the surface soil and having a pale-yellow color, with only slight mottlings of yellow and gray below.

Varying quantities of stone and gravel are scattered over the surface and disseminated throughout the soil mass. Sandstone and sandy shale, generally angular or subangular, are found if any stone is present, but these rocks also occur as rounded gravel and bowlders, and there are also glacial erratics of igneous and metamorphic origin.

The Volusia silt loam is one of the extensive soil types of the county. It occurs generally in large, unbroken areas, the largest development of the type being in the western part of the county.

In topography this soil ranges from rolling to hilly. It occupies the crests and slopes of some of the highest hills in the county. The slopes, however, are long and smooth and the crests smooth and rounded. On the broad interstream areas the surface is rolling. The elevation of such areas above sea level is from 1,100 to 1,200 feet or more.

While much of the Volusia silt loam lies so that the surface run-off of water is assured, the subsoil is rather compact and water enters the soil only less slowly than in case of the heavier types with which it is associated. Seepage places occur on the slopes, and in its virgin condition the type was wet and cold and benefited greatly by underdrainage. In fact, to bring this soil up to a high productive condition underdrainage is necessary, and much of it has already been improved in this way.

The Volusia silt loam is devoted principally to the production of the general farm crops. It also supports some dairying. There are on the type a number of highly improved farms that show a prosperous condition of the owners. When well drained the soil

gives good yields of all crops. Corn and the small grains are grown; also grasses for hay and pasturage. The soil can be easily improved, being retentive of fertilizers. Barnyard manure is used to the extent of the output and is supplemented by applications of commercial fertilizers to all crops. Liming is quite generally practiced on farms of this type and is always beneficial. The lime is applied before planting wheat, and makes the growing of clover possible. Litmus tests show the soil in many places to be in an acid condition.

The tree growth consists principally of beech and hard maple, with some other trees of less importance.

The average results of mechanical analyses of samples of the soil and subsoil of the Volusia silt loam are given in the following table:

Mechanical analyses of Volusia silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
271131, 271135.....	Soil.....	0.5	2.2	2.4	7.4	11.4	64.7	10.8
271132, 271136.....	Subsoil.....	1.0	2.8	3.1	8.8	15.4	49.8	19.2

VOLUSIA CLAY LOAM.

The surface soil of the Volusia clay loam has an average depth of 8 to 10 inches and consists of a rather heavy, friable silt loam to clay loam and in places silty clay loam. The material is for the most part rather granular, but carries enough clay to give it some plasticity when wet. This plasticity distinguishes it from the Volusia silt loam, which has a smooth, silty feel without stickiness. On the long slopes on the eastern boundary of the county south of Alliance and extending to the west the soil is generally of heavy character and contains considerable stone and gravel. On the more level higher places the texture of the soil is more silty, and the subsoil is also heavier, but the difference was not sufficient to warrant separation into a distinct type. The color of the soil ranges from brownish gray to grayish brown. When dry the surface has a dull ashy gray color, although in small spots it is known as "white clay land," the local name given land of the silty clay loam type.

The subsoil of the Volusia clay loam consists of a few inches of yellowish-gray or light-yellow clay loam resting on much heavier material mottled yellow and gray, which extends to a depth of 18 to 24 inches. At this depth there occurs a hardpan layer, like that under most of the upland soils, which is caused by a compacting rather than a cementing of gravel and sand with the finer soil particles and the formation of brown iron crusts. This layer is

only a few inches thick, and is underlain by heavy loam or clay loam carrying gravel and usually mottled with dark shades of yellow, brown, gray, and drab, the drab frequently becoming prominent. In places this hardpan is absent or thin, and the subsoil continues as a mottled yellow and gray or light-drab silty clay loam and stiff, plastic clay.

Stone and gravel are scattered over the surface and disseminated throughout both the soil and subsoil. These consist largely of angular and subangular fragments of sandstone. Igneous and metamorphic gravel and bowlders are also present. The quantity of fragmental rock, however, is not sufficient anywhere to interfere with cultivation.

The Volusia clay loam is one of the extensive and important soil types of the county. It occurs in what is practically one large body, cut by some rather irregularly shaped areas of associated soils, and confined to the four townships in the northeast corner of the county.

This type occupies the highest elevation in the county, the broad domelike divide or spur that extends from the watershed between the Mahoning and Tuscarawas drainage systems. The maximum elevation on this divide is somewhat more than 1,300 feet. The soil occupies the crest of the divide and the long slopes to the east and north. This elevated section is mainly formed of undulating or rolling country, and the surface is smooth and all of it cultivable, except where it breaks off to stream ravines or on short steep slopes. Over much of the type the surface favors the run-off, but flat places exist which are not so well drained, and except on the more pronounced slopes underdrainage is beneficial and profitable. Much of this land has been improved with tile drains.

The Volusia clay loam is an especially durable soil for grass production, and is well adapted to use as pastures. Where limed, clover makes a luxuriant growth. In moderately dry seasons this soil gives good crops of corn. The small grains also do well. General farming and dairying are practiced on this type, and usually the farms have a prosperous appearance. Land of this type, however, is not quite so desirable as that composed of the Volusia silt loam. The value of land of this type is $100 or more an acre, depending upon improvements. Beech and hard maple are the predominant tree growths.

VOLUSIA SILTY CLAY LOAM.

The surface soil of the Volusia silty clay loam to a depth of 8 to 12 inches consists of a brownish-gray, heavy silty clay loam. When dry the surface soil is characterized by a grayish or grayish-drab to almost white color. The subsoil is a mottled yellow and

gray or light-drab, stiff, plastic, silty clay, becoming usually very stiff and the gray color being displaced by drab in the lower part. Generally at 24 to 30 inches, but in places at a slight depth below the soil profile, the material becomes a bluish-gray, stiff, plastic clay. In cuts this clay shows up characteristically, drying into blocks and checks. The presence of this clay stratum, which is light in color when dry, together with the light surface color, has given this soil the local name "white clay land."

The Volusia silty clay loam occupies a large part of Lexington Township in the extreme northeast corner of the county. This soil body is interrupted only by the bottoms of Mahoning River and Beech and Deer Creeks, two of its tributaries. The type occupies what appears to be an old valley or lake basin. Seen from the hill crests surrounding it, this depression is marked, the difference in elevation being about 200 feet in a few miles. The origin of this body of the Volusia silty clay loam may be lacustrine, as the surface is flat and no stones occur in the soil, or it may be till, resulting from the glaciation of very soft shales. The only stones in the type are found adjacent to watercourses, where the soil material has evidently been modified by the streams while eroding their channels.

The surface of the type is flat or gently sloping, rising gradually from the streams to near the 1,100-foot contour, from which point the rise is usually more abrupt and another type of soil occurs. This rise in elevation is shown by the contours on the base map to be from 40 to 60 feet, but is so gradual that the land appears to the eye practically level.

The Mahoning River and its tributary creeks have cut rather wide trenches into this area and have built extensive flood plains. The fall to these flood plains is abrupt and from 20 to about 40 feet.

Owing to the impervious nature of the soil and subsoil and the flat surface, the type is poorly drained and generally wet and more or less seepy. The soil not only absorbs moisture very slowly, but delivers it slowly to plants, so that they are likely to suffer from drought. The soil gives better results with cultivated crops in a moderately dry than in a wet season. The type is greatly benefited by tile drainage; in fact, on some parts of it cultivated crops or small grains can not be produced without drainage. The yields obtained on this soil are low, and the general appearance of the type indicates a lack of development, although it is nearly all cleared. It is evidently best suited for use as pasture land. The farm dwellings and outbuildings are small, and there is very little evidence of extensive farming operations. The fields have become foul with weeds and briers. With thorough drainage this land should produce good crops of hay and small grains.

Mechanical analyses of typical samples of the soil and subsoil of the Volusia silty clay loam are given in the following table:

Mechanical analyses of Volusia silty clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
271103	Soil	0.9	3.1	2.6	4.4	5.6	62.8	20.7
271104	Subsoil	.6	1.4	1.7	4.5	6.4	49.7	35.6

VOLUSIA GRAVELLY CLAY LOAM.

The surface soil of the Volusia gravelly clay loam consists of a brownish-gray gravelly clay loam from 7 to 12 inches in depth. In undrained areas or slight depressions the color of the soil is drabbish or drabbish gray. The gravel content of this soil consists of fine to coarse gravel, mostly of sandstone and sandy shale, angular and subangular in shape. There are also rounded cobbles of sandstone and quartz and igneous rocks. Over much of the type the small gravel and stone fragments cover the surface, and there are small areas where larger stones and bowlders are found.

The subsoil consists of a grayish-yellow to light-yellow clay loam, becoming mottled yellow and gray in the lower part. At 15 to 18 inches the material usually becomes somewhat lighter or more sandy in texture, and at 18 or more inches is encountered a gravelly and sandy hardpan mottled yellow and gray, with some brown and darker yellow or even reddish. This material usually becomes more brownish or brownish yellow with depth and at 30 to 40 inches usually passes into a brownish gravelly sand. Below this there occur alternating beds of gravel and sand. The drab plastic clay is encountered frequently at a depth of 5 feet. Gravel and stone fragments are disseminated through the subsoil as through the soil.

The Volusia gravelly clay loam is found at the southwest margin of the old lake bed, lying in Lexington Township in the northeastern part of the county. It is closely associated with the area of Volusia silty clay loam. The area of the gravelly clay loam is less than 2 square miles.

The soil material is of glacial origin and consists of a delta deposit of streams emptying into an old lake or of glacial till reworked by water, or both.

The surface is flat, broken only by a few stream channels. In its original condition the soil is poorly drained and wet, but as stream courses and ravines reach back into its area tile drainage is easily effected, and when improved in this way the land is fairly productive of all crops grown in the county.

VOLUSIA LOAM.

The surface soil of the Volusia loam, to a depth of 7 to 12 inches, consists of grayish-brown to brownish-gray, friable, fine-textured loam, containing more or less gravel or stone. On areas of more uneven surface and of higher gravel content the brown color is more strongly developed and the soil is not very different from the Wooster loam described in a subsequent section of this report. The subsoil in the upper portion consists of a yellow loam, somewhat heavier than the surface soil, either retaining this texture to some depth or passing into a friable clay loam, mottled with yellow and gray. At 18 to 24 inches there is generally encountered a gravelly sand hardpan, showing some iron crust and mottled brown, yellow, and gray in color. Below this the material is gravelly or stony and sandy and in places consists of gravelly sand. Considerable quantities of stone and gravel are disseminated throughout the soil mass, the proportion being greater below 18 inches and in the immediate surface. It consists largely of sandstone, both rounded, waterworn or ice-worn gravel and angular and subangular fragments. There are also glacial erratics of quartz and other crystalline rocks.

The Volusia loam is found along stream courses, most of it at their heads. It is confined to the four townships in the northeastern part of the county and occurs in a number of areas, the largest of which extends north from Louisville, and along the streams on the north side of the divide.

The type is derived from transported glacial till. It probably represents both terminal and lateral moraine, some of which has been modified more or less by stream erosion.

The surface of the type is flat or nearly flat to somewhat broken. The flat areas are found on the points between streams, while farther up and on the slopes the surface is uneven, though not enough so to make cultivation difficult.

Owing to its nearness to stream courses and its gravelly character the type has fairly good drainage, notwithstanding that there is a more or less impervious hardpan in the subsoil.

The Volusia loam is considered good farming land. It is adapted to a wide range of crops, holds moisture and fertilizers well, and responds readily to good treatment.

Corn, wheat, and oats give good yields. A crop rotation, including grasses and clovers, is generally practiced. Potatoes, orchard fruits, and berries do well.

Beech is the predominant tree on this type. Hard maple, hickory, and oak are also important species in the forest.

The Volusia loam is known locally as "gravelly land," and is more highly esteemed than the other Volusia soil types.

In the following table are given the average results of mechanical analyses of samples of the soil and subsoil of the Volusia loam:

Mechanical analyses of Volusia loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
271101, 271127.....	Soil.....	3.3	6.6	7.6	14.6	8.8	46.2	13.1
271102, 271128.....	Subsoil.....	4.1	7.6	9.0	15.6	11.6	36.6	15.1

Wooster Series.

The soils of the Wooster series are yellowish brown to light brown in color. The subsoils are yellow to brownish yellow, showing often a faint reddish cast, and are friable and free from mottling, all members of the series being naturally well drained. They occupy upland areas through the glacial region usually where glaciation has been heavy and the till is deep, and vary from smooth rolling to irregular morainic in topography. They are derived very largely from sandstone and shale. In comparison with the Volusia soils, with which they are often associated, they are better drained and considered much the better agriculturally.

Wooster silt loam.

The surface soil of the Wooster silt loam, to an average depth of 8 inches, consists of a light-brown to yellowish-brown silt loam which contains enough very fine sand to make it friable and rather mealy. There are some local variations in which the fine sand content is higher and others in which the soil is somewhat heavier than usual. When dry this soil becomes grayish brown, but not so gray as the soils of the Volusia series. In its surface appearance, except where the soils are in a gradational zone, it is generally quite distinct from the Volusia soils, because of its darker and richer color.

The subsoil varies to some extent in texture, but usually in its upper part consists of friable silt loam only slightly heavier than the surface. This texture may continue throughout the soil profile of 36 inches, or it may become a heavy loam, but usually within 15 inches or less of the surface it grades into clay loam or silty clay loam. The color is yellow or brownish yellow, being distinctly darker than the characteristic subsoil of the Volusia silt loam. It frequently has a reddish cast in the lower portion. At 18 to 24 inches there is usually found a stratum, locally known as hardpan, in which gravel and sand and the finer earthy materials are compacted and some iron crusts have been formed, the latter being conspicuous on account of their rusty-brown color. This stratum

may be very thin or it may be several inches thick. It is characteristically mottled with yellow or brownish, and mottling may be found in the material beneath it. The subsoil when bored into in a dry condition crumbles readily, but it carries enough clay to be more or less plastic when wet.

There are usually some stones and gravel on the surface and in the soil mass of the Wooster silt loam, especially below 15 inches. The stone is largely sandstone, consisting of angular, subangular, or rounded fragments and small blocks. There are also rounded gravel consisting of crystalline rocks from a foreign source. Some larger bowlders of this soil are also to be found, but as a rule these were removed at the time of clearing the land. The depth of the material varies considerably. On ridge tops and steep slopes, where the underlying sandy shales and shaly sandstones come close to the surface, it is only a few inches deep, while on lower slopes and in valleys it has a thickness of at least 4 or 5 feet.

The Wooster silt loam is the most extensive soil type of the county. It is largely confined to an irregular belt of detached areas extending through the county from east to west. It lies between the morainal belt of the northern part of the county and the residual southern part, and occupies rolling to hilly uplands. The hills have rounded tops and the slopes are usually gentle and smooth. Where the type joins the residual section the hills are bolder and the slopes commonly quite steep. A part of the type occupies filled-in valleys where the surface is flat to gently undulating, and has in many places the appearance of a terrace.

The type as a whole has good surface and subsurface drainage, yet has enough body to hold moisture well. The more level areas and draws on slopes are benefited by tile drainage, but the steeper areas on hill slopes are badly damaged by rapid surface run-off of water unless care is taken to prevent it.

Agriculturally the Wooster silt loam is one of the most important soil types of the county. It is a friable, mellow soil, is easily kept in good tilth, and produces good yields of all farm crops, including the small grains, grasses, and clovers. Commercial fertilizers, at the rate of 100 to 200 pounds per acre, with barnyard manure are used on corn and wheat. Bone meal is also used to some extent for wheat. The soil and subsoil are generally acid and are given light applications of lime. Clover and timothy sod are turned under as green manures. As the farms are largely devoted to dairying a considerable acreage is kept in grass or clover for hay and pasturage.

While there are no extensive orchards on this type, apples do well and could be profitably grown on a larger scale. The small fruits also do well.

The value of farms of this type ranges from $100 to $200 or more an acre, depending upon the character of the buildings and other improvements.

The average results of mechanical analyses of samples of the soil and subsoil of the Wooster silt loam are given in the following table:

Mechanical analyses of Wooster silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
271137, 271145.....	Soil.....	1.2	2.3	2.3	6.4	14.7	60.4	12.4
271138, 271146.....	Subsoil.....	1.3	2.5	2.2	5.8	10.6	55.5	21.7

WOOSTER LOAM.

The surface soil of the Wooster loam, to an average depth of 8 inches, varies from a fine-textured loam, slightly sandy, to a silty loam, friable and somewhat mealy. The color is light or grayish brown at the surface to yellowish brown beneath. The subsoil consists of a yellow or brownish-yellow loam, somewhat heavier than the surface soil, continuing to a depth of more than 36 inches, but often becoming a friable clay loam at 15 inches or so beneath the surface. In many places the subsoil has a reddish color, especially in the lower portion. In some places at 18 to 24 inches there is encountered a slightly gravelly and sandy hardpan, containing some iron crusts. Stones and gravel, mostly rounded sandstone, with some quartz and other crystallines, are scattered over the surface and disseminated throughout the soil mass, being so abundant below 18 inches that the soil auger can with difficulty bore to greater depth. There are also present in places angular and subangular sandstone and shale fragments, especially on the steep slopes of ridges next to streams. In many places the quantity of stone is sufficient to interfere materially with cultivation.

The Wooster loam is one of the extensive soil types of the glaciated section of the county, occupying a broad belt of morainic country. The largest area, broken by some areas of other soil types, extends from Navarre on the Tuscarawas north to the county line. There occur also smaller, isolated areas in all except the northeast part of the glaciated area of the county.

The topography of the Wooster loam is largely broken, and consists of round, steep-sloped knolls with intervening kettle-hole depressions or flat, plainlike areas. In places the surface is more rolling, and some of the type occupies smooth glaciated hills. It is also found on the lower slopes of some of the ridges next to streams. These are commonly hummocky, rather than smooth, regular slopes.

The Wooster loam is naturally well drained, and where the gravel content is high the drainage is excessive and crops suffer from moisture in ordinary dry spells. Where the subsoil is heavier and not so gravelly or stony it is quite retentive of moisture. Underdrainage is rarely necessary.

The Wooster loam constitutes one of the general farming soils of the county. It is well suited to the production of corn and potatoes. A system of crop rotation is practiced including the small grains, grasses, and clovers. Its uneven surface and good drainage make this a good soil for orchard fruits and berries, for which it is utilized to some extent. There are a number of small peach orchards upon it. The smoother portions of the type have a high value. While the rougher areas are difficult to cultivate, they produce fair crops.

The different species of oaks and chestnut form the main tree growth upon this soil.

The average results of mechanical analyses of samples of the soil and subsoil of the Wooster loam are given below:

Mechanical analyses of Wooster loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
271125, 271141.....	Soil.....	1.7	4.4	5.7	15.3	13.6	49.4	9.5
271126, 271142.....	Subsoil.....	3.0	5.2	6.6	17.5	16.7	36.1	14.4

WOOSTER GRAVELLY LOAM.

The Wooster gravelly loam is closely associated with the Wooster loam. It is a similar soil texturally, but has a higher gravel content and a more hummocky topography. The surface soil to a depth of 6 to 10 inches consists of a light-brown to yellowish-brown friable loam to silty loam. It carries a large quantity of small rounded gravel, the surface generally being completely covered by such coarse material. The subsoil is a yellow friable loam to friable clay loam which, at a depth of 15 inches, is usually very gravelly and frequently quite sandy. As a rule the gravel content is so large that the soil auger will not penetrate beyond 18 inches. Openings in the knolls on this type show pockets or beds of gravel and sand, the former being used for road surfacing and the latter for building purposes. The irregular hummocky areas or kames, where the subsoil consists of stratified sands and gravel, are in reality the Otisville gravelly loam, but no attempt was made to show these separately.

The Wooster gravelly loam is found in the glaciated region of the county, excepting the extreme northeastern part. It is largely con-

fined to the morainic belt, though also occurring along the streams. The areas are not large and are disconnected. The more important are in the north-central part of the county.

The type is of glacial origin, being derived partly from morainic dumps of gravel and sandy material, with little or no stratification, and partly from kames and eskers where the material was laid down by rushing waters, the soil weathering from these. While in the morainic belt it is for the most part a terminal moraine formation, it is evidently lateral moraine, kames, and eskers along stream valleys. The gravel is all rounded and consists of sandstone, some quartz, and igneous and metamorphic crystallines, these latter of foreign source, transported by the ice from the Canadian regions and intermingled with the material of near-by local origin.

The topography is very uneven, consisting for the most part of low, rounded, gravelly hills with steep slopes and having kettle-hole depressions between them. The belts or areas along the streams outside of the moraine are either hummocky slopes or have typical morainic topography.

The type as a whole is well drained. In many places, especially where the gravel content is very large, drainage is excessive and the soil droughty. The kettle holes often contain water throughout the greater part of the year. When large enough they constitute other soil-type areas.

The Wooster gravelly loam is devoted to the general farm crops common to the section. Where the surface is very rough it is difficult to use improved machinery, but the small grains are grown in the rotation as on other soils. Owing to the good drainage, the soil can be worked and crops planted early in the spring. It is an easy soil to cultivate and if the season is not too dry gives fairly good yields. On the more level areas potatoes yield well and are of good quality. Peaches and berries also thrive on this soil. Some areas are devoted more or less permanently to pasture. Pasturage starts early in spring, but during dry periods in summer it is scanty.

The chestnut is a prominent tree on this soil, as are also different species of oaks and some other hardwoods.

In the following table the average results of mechanical analyses of samples of the soil and subsoil of the Wooster gravelly loam are given:

Mechanical analyses of Wooster gravelly loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
271121, 271143.....	Soil.....	2.3	5.5	7.9	11.2	12.7	46.1	14.1
271122, 271144.....	Subsoil.....	4.8	12.9	15.1	16.4	7.8	27.7	15.1

WOOSTER SANDY LOAM.

The surface soil of the Wooster sandy loam to an average depth of 8 inches consists of a sandy loam of medium to rather coarse texture and of light-brown to yellowish-brown color. In places the color is a dark brown, and in others, as on high spots, it is much lighter and has a grayish cast. The type includes small spots where the texture is practically that of a loamy sand, and others in which it is a fine sandy to almost silty loam. There is a varying content of gravel, which is usually of the finer grades. In places the soil is entirely free of gravel and in others it is quite gravelly.

The subsoil is a brownish-yellow sandy loam, frequently having a reddish tinge, with a depth of several feet. The greater part of it is like the surface soil, having a rather coarse texture and containing coarse sand pockets and fine to small rounded gravel, the quantity of which, except in pockets, is not very large.

The Wooster sandy loam is not an extensive soil type in the county, being confined to three occurrences. The largest of these is north and east of Canal Fulton, the next largest is on the east side of the Hartville bog near New Baltimore, and the third, including a couple of small areas, is on the county line north of McDonaldsville in Jackson Township. These areas occur in the morainic belt, in association with lake or bog areas.

This type is of morainic origin, the surface being uneven or hummocky, with some areas undulating or flat and rather terracelike but showing kettle-hole depressions. Some of these may be old glacial-lake terraces.

The natural drainage is free and apt to be excessive, especially in the more sandy spots. It is thus a droughty soil, but fair yields are obtained of most farm crops. It is a warm, early soil and valuable for gardening and the production of berries.

Results of mechanical analyses of samples of the soil and subsoil of the Wooster sandy loam are given in the following table:

Mechanical analyses of Wooster sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
271119	Soil	2.9	9.6	15.5	28.4	6.7	28.9	7.7
271120	Subsoil	2.6	9.9	19.4	40.1	6.4	15.9	5.7

DEKALB SERIES.

The surface soils of the Dekalb series are gray to brown, and the subsoils commonly some shade of yellow. The series is residual,

and derived from the disintegration of sandstones and shales, of Silurian to Carboniferous age. The surface features consist of gently rolling table lands, hills, and mountains.

DEKALB SILT LOAM.

The surface soil of the Dekalb silt loam consists of a light or grayish-brown to yellowish-brown friable silt loam. In depth it varies according to position. On steeper slopes it is 4 to 6 inches deep, while in level areas, or upon lower slopes, where the soil has accumulated through creep, it is 8 to 12 inches deep. The subsoil consists of a pale-yellow silt loam, grading generally within a few inches into light-yellow silty clay loam, and frequently into clay or silty clay. On slopes the immediate surface soil is silty and rests directly upon silty clay loam without the intervening stratum of silt loam, but usually in this case the surface soil is slightly heavier. The depth of the subsoil is variable. The underlying rock may be encountered anywhere beneath the surface from a few inches to several feet, depending upon the activity of erosion. Outcropping ledges are not very common, but fragmental shale and sandstone are found on steeper slopes. On flat to gently sloping areas rock fragments may be entirely wanting. Such coarse material ranges from small pieces of sandstone and flakes of shale and sandy shale to small blocks several inches in diameter. It is rarely found in sufficient quantity to interfere with cultivation.

In extent, at least, the Dekalb silt loam is one of the important soil types of the county. It is found in the southern part of the county and, with the exception of Dekalb sandy loam, constitutes all of the unglaciated uplands. East from the Tuscarawas River it occurs in one large body, broken only by valleys with their terrace soil. West of the Tuscarawas it is confined to the tops of ridges and hills which were either not glaciated or only slightly so. These latter areas are disconnected and scattered and more or less stony.

The topography of the Dekalb silt loam is very hilly and broken, consisting of a much dissected plateau, resulting in sharp, narrow ridges with steep slopes to narrow V-shaped valleys, except where the large streams, as Sandy Creek, have carved out broad, troughlike valleys. The greater part of the type is so steep as to be cultivated with difficulty, and such rapid run-off takes place that severe washing and gullying result if preventive measures are not adopted, especially on cultivated areas. When in sod the soil is bound by the grass roots and protected by the surface mat, so that erosion affects pastures but little. The soil is somewhat droughty, crops suffering for moisture in ordinary dry spells.

The Dekalb silt loam is a soil of moderate to low productiveness, but by using small quantities of commercial fertilizer, turning under

sods, and applying what manure is available moderate yields of corn, wheat, oats, timothy, and clover are obtained.

Liming is practiced to some extent in order to correct acidity and to get satisfactory stands of clover, and is always found beneficial.

Potatoes, small fruits, and berries do well on this soil. The wild raspberry and the wild blackberry flourish, forming thick brambles in neglected fields and fence corners. Apples thrive and there are always some trees around the houses. There are also a few orchards. Owing to the hilly topography there is a large proportion of each farm in grass for hay and pasturage.

Different species of oak and chestnut are the predominant tree growth, with poplar, hickory, walnut, and some other species in the ravines.

Farm values range from $30 to $100 an acre.

DEKALB SANDY LOAM.

The soil of the Dekalb sandy loam consists of 6 to 8 inches of a light-brown to yellowish-brown sandy loam. The texture varies considerably, ranging from fine to medium to rather coarse, the greater part of the type being of medium texture. The subsoil is a pale-yellow sandy loam, usually somewhat sticky, frequently varying to a darker yellow or reddish color, especially where the depth is shallow. The depth of the soil material ranges from 8 to 10 inches to more than 36 inches, the ordinary depth ranging between 18 and 24 inches, where broken or disintegrating rock is encountered. There is always more or less broken sandstone and sandy shale on the surface and in the soil mass, the pieces ranging from little flakes and fragments to blocks several inches in thickness. In places these are sufficiently numerous to interfere with cultivation, but such areas are too small to be separated and shown on the map as a distinct type of soil.

The Dekalb sandy loam occurs in numerous small areas in Osnaburg, Pike, and Sandy Townships in the southern part of the county. The areas lie upon the steep peaks and narrow tops and steep upper slopes of ridges. The drainage is thorough and in many places excessive.

Many of the Dekalb sandy loam areas are forested, oak and chestnut being the predominant trees. The soil is of low productiveness, and is too light and droughty for grass, so that it is not good pasture land. Near Osnaburg it is devoted to the growing of fruit, mainly peaches and berries, of which fair crops are obtained. These products are disposed of in the local markets.

Holston Series.

The Holston series includes types with yellowish-brown to brown surface soils and yellow subsoils. It is developed on old alluvial

terraces, sometimes 200 feet or more above the first bottoms of streams. The soils are formed principally of material washed from sandstone and shale soils, and on this account are somewhat less productive than the Elk soils, a similar series containing more limestone material. The Holston soils are generally underlain by sandstone or shale, and in places the lower subsoil may be partly residual from these rocks.

HOLSTON SILT LOAM.

The surface soil of the Holston silt loam to a depth of 8 inches consists of a grayish-brown or light-brown to yellowish-brown, smooth, friable silt loam. This is underlain by a yellowish-gray to pale-yellow silt loam, which changes to a brighter yellow and to heavier texture, and grades through compact silt loam to silty clay loam. In places the lower portion of the subsoil is somewhat mottled with yellow and gray. Both soil and subsoil are free of stones and gravel.

The Holston silt loam is of small extent and is found only in the southern part of the county, in Pike, Sandy, and Osnaburg Townships. The areas form narrow strips on terraces of the streams tributary to Sandy Creek. The surface of these terraces is flat, except near streams where erosion has cut back into them. They lie between 20 and 40 feet above the stream beds.

As the areas of this type are not large and lie close to streams they have good drainage notwithstanding their level surface. Owing to its compact subsoil and lack of gravel it is retentive of moisture, but not to such an extent as to make it wet or seepy.

In agricultural value the Holston silt loam does not differ greatly from the level areas of the Dekalb silt loam. It is a moderately productive soil and produces fair yields of the general farm crops, but is not an especially good soil for grass. It can be readily improved by good management. Owing to its small extent this type is not of much importance, although it is more highly desired than the surrounding hilly land, owing to its position and its level surface.

CHENANGO SERIES.

The Chenango series includes types having yellowish to light-brown surface soils and brown to yellow subsoils. A characteristic of the series is the uniform occurrence at the depth of 3 feet or more of stratified gravel sand.

The series includes terrace soils, occurring along streams in those sections of the glaciated region where the upland soils result from the glacial grinding of shales and sandstones, with only a moderate admixture of other material. The material forming the series was deposited by swiftly flowing streams of water. With deeper erosion by the streams, this material was left as terraces and is not now

subject to overflow. The series is often associated with the Dunkirk series of lake deposits in New York and forms southward extensions of similar material along the streams. It is also developed in Ohio, Indiana, and some of the other Central States, where it was originally mapped as Miami gravelly loam.

CHENANGO GRAVELLY LOAM.

The surface soil of the Chenango gravelly loam, to a depth of 7 to 12 inches, consists of a light-brown or dark-brown to yellowish-brown, friable, mealy, silty to somewhat sandy loam, containing varying quantities of gravel and coarse sand, the surface in many places being nearly covered with gravel. The subsoil consists of a brownish-yellow loam to friable clay loam more or less gravelly. At 15 to 24 inches a gravel bed is encountered, which generally prevents the soil auger from penetrating below 18 to 20 inches. In places the subsoil has a distinctly reddish cast, particularly in the more open porous areas of the type.

The gravel is usually fine gravel to fragments 1 or 2 inches in diameter, though beds of larger gravel or small cobbles may occur. The gravel in many places consists largely of sandstone, but a distinguishing characteristic of the type is the presence of gravel of formation foreign to the region, consisting of quartz and other crystalline rocks.

The Chenango gravelly loam is found in areas along the streams in the southern part of the county, largely outside of the glaciated area, but only on those streams that head in that region. It forms a part of the terraces along these streams and lies for the most part between 20 and 40 feet above mean water level. Along the Tuscarawas River the areas are as high as the Chenango silt loam. The surface of these terraces is flat to slightly undulating, the undulations being the result of erosion. Next to streams they break into rather steep slopes, and in a few places the slopes from the Chenango silt loam terrace have been gravelly enough to be included in this gravelly type.

This soil is thoroughly and much of it excessively drained, and crops are likely to suffer for want of moisture during ordinary droughts.

The Chenango gravelly loam is one of the desirable soils of the county. Its thorough drainage causes it to warm early, and its friable structure makes it easy to keep in good tilth. It is especially well suited to the cultivated crops, such as corn and potatoes, and fair yields of the small grains are obtained. It is not so suitable for the production of grasses. Berries and vegetables do well upon it. Fertilizers are used on the different crops in addition to barnyard manure. Farms on this type have a prosperous appearance.

CHENANGO SILT LOAM.

The surface soil of the Chenango silt loam varies from 7 to 15 inches in depth, and consists of a light to yellowish-brown, friable, mealy silty loam or silt loam, generally containing considerable fine sand. In spots the soil is a very fine sandy loam and in others it is a gravelly loam slightly sandy. The subsoil consists of a somewhat heavier and more compact silt loam than the surface soil and in its upper portion is somewhat lighter in color than the latter. The color abruptly changes, however, into brownish yellow, and frequently the lower portion has a reddish cast. It carries enough sand to render it friable and in places consists of a friable clay loam to silty clay loam. Its content of clay is enough to make it somewhat plastic when wet. The depth of the subsoil varies. Much of it is more than 36 inches deep, but the gravelly substratum characteristic of the type may occur either within the soil profile or at most 4 or 5 feet below the surface. Near the stream courses or ravines the gravel is found within a foot or two of the surface, and in many small areas gravel is scattered over the surface and through the soil mass. The gravel particles are rounded and range in size up to 1 or 2 inches in diameter. Sandstone largely but in part quartz and other crystalline rocks form this coarse material.

The Chenango silt loam is found on the terraces of the Tuscarawas River and its larger tributaries on the border of and extending outward from the glaciated region. The largest areas are found south of Massillon, where broad terraces extend south practically without interruption on both sides of the river. A large area forms the terrace on which Canton is situated in the forks of Nimishillen Creek. Another large area is on Sugar Creek, south of Beach City, on the southern boundary, extending into Tuscarawas County. Small areas occur along Sandy Creek and its tributaries in the southeast part of the county. These terraces range from 20 to 100 feet above the streams.

The surface of these terraces is flat to gently undulating, with rather steep slopes descending to other terraces or to the first bottoms. Occasionally different levels or terraces are found, but usually when this occurs the lower ones are composed of the gravelly type of the series. In places these terraces have been dissected by lateral streams.

The gravelly and sandy substrata in these terraces insure good drainage, and where the gravel bed comes close to the surface drainage is excessive and the soil droughty, but the greater part of the type is capable of maintaining a good moisture supply under most conditions.

The Chenango silt loam, though of comparatively small extent, is one of the most productive soils in the county and suited to a wide range of crops. Its level surface makes it an easy soil to cultivate with improved farm machinery; it is an early soil because of its good drainage; and its structure favors the maintenance of good tilth. It produces good yields of all the farm crops. Corn yields from 40 to 75 bushels or more and wheat 15 to 30 bushels per acre. Oats do well, and timothy and clover give heavy yields of hay. Alfalfa is also successfully grown. Potatoes and small fruits do well on this soil.

Fertilizers are used on this soil as on most of the farms in the county. Lime is also employed to some extent. The soil is similar to the Wooster silt loam and requires about the same treatment.

The appearance of farms on this type indicates a prosperous class of farmers. The houses, barns, and outbuildings are large and in good condition, and the farms generally well kept. The value of land of this type is higher than that of any of the other soils of the county with the exception of developed areas of Muck. Most of the areas lie in valleys traversed by railroads, and this enhances the land values.

CHENANGO SANDY LOAM.

The surface soil of the Chenango sandy loam to a depth of 8 to 10 inches consists of a light-brown to dark-brown or yellowish-brown medium to rather coarse sandy loam, containing considerable organic matter. Small areas occur, such as hummocks only a few feet high, in which the soil is a loamy sand, and others are quite gravelly, especially on the short slopes between terraces.

The subsoil consists of a brownish-yellow sandy loam, the upper portion of which is of the same texture as the surface soil. This becomes more gravelly with depth and at 15 to 30 inches usually rests upon a gravelly stratum. In the absence of such a stratum the sandy and gravelly material may extend some depth beyond the 3-foot section. The gravel is rounded and consists of sandstone, with some quartz and other crystallines, the two latter being entirely of foreign origin.

The Chenango sandy loam is of small extent, being confined to a number of small areas occupying second bottoms or high terraces along Sandy Creek and its tributaries in the southern part of the county. These areas are not continuous, being broken by the winding course of the streams and by areas of other terrace soils. Their surface is flat, with occasional slight undulations and small hummocks of wind-blown material, and is broken to some extent by erosion where streams cross from the upland valleys and ravines.

The open character of the type and the gravelly substratum insure the best of natural drainage and the soil warms up early in the spring.

The type is all under cultivation and is fairly productive of cultivated crops, but is too open and dry for the production of grasses. Pastures are especially poor. It is not so highly esteemed as the Chenango silt loam, but has a wide range in crop adaptation.

Fertilizers are used for all crops in addition to barnyard manure. It is highly desirable to incorporate as much organic matter in this soil as possible to increase its water-holding capacity, as well as its fertility.

Huntington Series.

The Huntington series includes types with light-brown to brown surface soils, and yellow to light-brown subsoils. In many places there is little change in the color or the character of the material from the surface downward. The soils are developed in the Limestone and Appalachian Mountain regions in the first bottoms of streams, where they are subject to overflow. They consist of material derived from limestone, sandstone, and shale soils, and represent the best drained soils of the first bottoms.

Huntington silt loam.

The surface soil of the Huntington silt loam to a depth of 10 to 15 inches consists of a brown or yellowish-brown, friable, mealy silt loam, frequently quite sandy in spots and especially so on the higher knolls or the natural levees of the streams. The subsoil is of the same texture as the surface soil to a depth of 18 to 24 inches, where it generally becomes more sandy, ranging from sandy loam to loamy sand. Gravel is frequently encountered in the lower part of the soil profile of 36 inches. The subsoil is of yellowish-brown to brownish-yellow color. In low spots the heavier textures usually prevail and more or less mottling of grayish yellow and brown is found. The type as a whole is not uniform, areas occurring where the material approaches that of the gray or white bottom-land soils. There are also small spots in which some gravel is scattered over the surface.

The areal extent of the Huntington silt loam is small, the type being confined to the small, narrow first bottoms along the lower course of the Tuscarawas River, its large tributary, Sandy Creek, and some of the smaller creeks tributary to these streams. It lies less than 20 feet above the streams and is subject to annual overflow. While the drainage of much of the type is poor, it is not so poor as that of the light-colored bottom soils. Wet spots are numerous where brush, grasses, and rushes grow, and some of these spots are more or less mucky, or have a light-colored soil.

The Huntington silt loam is of alluvial origin, having been deposited as flood plains along the streams where it is found.

Most of this type is left in permanent pasture, to which it is well adapted, but when thoroughly drained it makes a good soil, being especially suitable for corn, of which the yields are large when the crop is not damaged by freshets.

Elm, sycamore, walnut, and hickory are the most common trees.

Holly Series.

The soils of the Holly series are characterized by the gray color of the surface material and the mottled gray and yellow or brown color of the subsoil material. These soils are developed in first bottoms, are subject to frequent overflow, and are poorly drained. The component material is wholly alluvial, and is derived from the soils of the sandstone and shale formations of the Appalachian Mountains and from the Limestone soils of the Limestone Valleys and Uplands.

HOLLY CLAY LOAM.

The surface soil of the Holly clay loam to a depth of 6 to 12 inches consists of a rather heavy silt loam to silty clay loam, or even silty clay. When dry the surface is decidedly gray in color, but when moist it is dull gray to brownish gray. When examined closely the material is generally found to be mottled gray, light-gray, pale-yellow, and brown. Sometimes it is largely rusty brown with some drab, the brown color being caused mainly by the presence of iron crusts or bog ore material. The subsoil may continue as a mottled yellow, gray, and drab silt loam to a depth of 36 inches, but usually either becomes heavier—a silty clay loam which may grade into soft, plastic clay, also mottled, but largely drab or bluish drab in color—or grades into a sandy silt loam or sandy clay or clay. There are also spots in which small rounded gravel are encountered. These occur at any depth within the profile, but especially in the lower part. The different textured materials are in many places found in alternating strata, showing the sedimentary character of the deposit.

Variations consisting of small mucky or peaty areas, spots of black clay of the Papakating series, and brownish areas of the Genesee soils occur in the type. These where of sufficient extent have been mapped separately.

Areas of this variable soil type are found along and at the heads of streams throughout the county, and for the most part represent low first bottoms, but little above the streams. The areas lying in belts in the valley floors are level, except for minor inequalities formed by sloughs and other depressed spots of swampy or swaly character. The broader areas at the heads of streams are gently sloping.

The Holly clay loam is so poorly drained that it is wet in even the driest seasons of the year, being commonly known as "wet meadow" or "wet first bottoms." Extensive operations would be necessary to perfect the drainage of these lands.

Because of its generally wet condition and the difficulty of draining it, very little of this soil is cultivated. It is used almost entirely for pastures. It supports a great variety of grasses and sedges, which furnish good pasturage throughout the season. The swales and sloughs are too wet for pasturage. They are grown up with reeds, rushes, and other water-loving plants.

The small areas drained by ditching and tiling produce good crops of corn, but are still too wet for the small grains. The latter are also subject to damage by overflows.

On forested areas of this type beech, elm, and maple are the principal trees.

PAPAKATING SERIES.

The soils of the Papakating series are dark brown to black, with grayish, drab, or mottled yellow and gray subsoils. They occur along streams in the glaciated region, and the sediments are the wash from upland soils of glacial but not of loessial origin. The soils contain, however, no appreciable amount of stratified gravel, either in the subsoils or substratum. They are subject to overflow and are usually poorly drained. They are darker in color than the soils of the Genesee or Ondawa series, and differ from the latter also in the absence of a gravel substratum. This series is the eastern representative of the Wabash.

PAPAKATING CLAY LOAM.

The Papakating clay loam is associated with the Holly clay loam and the Muck and Peat areas and with gradations into these constitutes a variable soil in texture and color. As mapped it consists typically of 8 to 12 inches of dark-brown or black silty clay or heavy silty clay loam, which is rather gumbolike when wet and upon drying checks into blocks. Frequently the surface is lighter colored, as brownish drab or even somewhat reddish. In places the soil is somewhat mucky, and in others it is a little more silty in texture. The type is very patchy, differences in color and texture being found at frequent intervals.

The subsoil usually consists of a black to bluish-black or bluish-gray plastic clay, which may change with depth into a drab and mottled drab and yellow clay. In places it becomes sandy in the lower part of the profile and frequent mucky layers are found beneath the heavy surface and subsurface portions. The subsoil extends to depths greater than 36 inches.

The Papakating clay loam is of small extent and confined to small areas in the glaciated section of the county, mostly in the morainic belt, with two of the larger areas in the eastern part of the county. It occupies first bottoms lying along streams issuing from swamps or bogs, or around the bogs or small lakes themselves. It is in part alluvial, and probably in part lacustrine, having been formed under varying conditions of sedimentation and influenced by the presence of mucky areas and of muck substrata formed during periods when swampy conditions prevailed.

The soil is wet and very little used for anything except pasture. Small areas are cultivated to celery and onions in conjunction with Muck and Peat areas, and produce good yields. Where ditched and drained it produces heavy yields of corn.

Miscellaneous Material.

MUCK AND PEAT.

In Stark County Muck and Peat are mapped together, as even where the distinction could be made the two materials are so intimately associated that separation was not practicable. Muck consists of the more finely divided and thoroughly decomposed vegetable matter, with some admixture of mineral material deposited by water or blown in from the surrounding lands by winds. It is of a deep-black color. Peat is more fibrous than Muck, generally rather coarse, and of brown color. Muck varies from a few inches to several feet in depth, and is frequently underlain by material similar to that forming Peat areas. Along some of the streams the Muck has a depth of 3 feet or more, and is underlain by blue or drab clay or compact, impervious sand. Wherever found, whether in areas along streams, or in the bogs and swamps, the impervious clay or, to a less extent, sand is found at some depth. This may vary from 2 feet in the shallow occurrences to 15 feet, or possibly more, in the deeper swamps. The vegetable matter forming the bulk of Muck and Peat comes from the growth and decay of a great variety of swamp vegetation growing usually in depressions left by the ice in the glacial till and along stream valleys where drainage has either been entirely lacking or restricted.

The Muck and Peat areas, although rather small, are numerous, and cover a considerable extent of territory in the aggregate. They are distributed throughout the morainic belt in the north-central part of the county. The two largest areas are the bog or swamp east of Hartville and the area south of Meyers Lake near Canton.

In a considerable number of instances these areas have been thoroughly drained and an important trucking industry developed upon them. They are used especially in the growing of celery and onions.

and near Canton and Massillon a number of vegetables besides these are grown to supply the local market. The yields are good and the products of excellent quality, as is usually the case on soils of this sort. Large quantities of barnyard manure and commercial fertilizers are used in growing these special crops.

Muck and Peat vary considerably in value. Near Canton developed areas are held at $400 to $700 an acre. These areas owe their high price mainly to their advantageous location to the local market. Farther away the unreclaimed land is held at $75 or more an acre and the cleared and cultivated land at $200 to $400 an acre.

SUMMARY.

Stark County is situated in an elevated plateau region of northeastern Ohio.

It comprises an area of 580 square miles, or 371,200 acres.

The topography is rolling to hilly. The northern part has been glaciated and smoothed by the ice; the southeastern part is dissected and hilly.

Drainage is into the Ohio River, through the Tuscarawas and Mahoning Rivers.

Settlement began in 1805. A large part of the rural population is of German descent.

Canton, the county seat, had a population of 50,217 in 1910. Alliance and Massillon are cities of approximately 15,000. There are a number of places with a population of 1,000 or less.

The county is exceptionally well supplied with transportation facilities.

Wagon roads are numerous and in part paved or surfaced with stone or gravel.

A good demand exists for all farm products in the cities and towns of the county.

The mean annual temperature is 49.6° F., the mean annual precipitation 39.16 inches, and the average depth of snow 38.1 inches.

The winters are moderately cold, and the growing season is sufficient to mature corn and the other general farming crops grown north of the cotton belt.

The farm practice of the county on all except the Muck and Peat soils consists of general farming and dairying. The staple crops, corn, wheat, oats, clover, and timothy, are grown largely and supply the farm stock and dairy. Potatoes are grown in some localities as a field crop. There is no commercial apple growing, but some peaches and berries are produced for market. In the Muck and Peat bogs an intensive trucking industry has been developed. Celery is the main crop. Onions are grown to some extent, and near Canton and Massillon some other vegetables.

The country rock is composed of alternating beds of shales and sandstones, and to a less extent of limestones, fire clay, and coal beds, all of carboniferous age. An area of these has been glaciated and an area has not.

Nineteen types of soil, including Muck and Peat, were separated and mapped in the county. These fall into three main groups, viz, residual, glacial, and alluvial. The residual soils are found in the southern unglaciated part of the county, and are derived through weathering from sandstones and shales in place. They comprise a silt loam and sandy loam included in the Dekalb series.

The glacial soils fall into two groups, those on the uplands, derived from the unmodified drift, and those in the valleys from modified drift.

The upland glacial soils comprise nine soil types, representing two soil series, viz, the Wooster and Volusia. The Wooster soils constitute good general farming lands, with a wide crop adaptation. The Volusia soils are used for general farming and are best suited to small grains and grasses.

The glacial soils of the second, or terrace group, are found along all the streams flowing out of the glaciated region. They comprise the Chenango series. These soils constitute good general farming land. Certain of the types are especially valuable for use in the production of potatoes, orchard fruits, and small fruits. The Holston silt loam is a terrace soil derived from Dekalb material. It is a moderately productive soil, used for general farming.

In the flood plains of the streams in different parts of the county are found three series of the alluvial soils—the Holly, Huntington, and Papakating. These are poorly drained and utilized mostly for pastures.

Areas of Muck and Peat have been formed in kettlehole and larger depressions in the glaciated uplands and along some of the streams.

The Muck and Peat are utilized for trucking, celery being the principal crop, with some onions and vegetables. Where thoroughly drained and developed areas of these organic soils from the highest priced lands in the county.

○

CURTIS F. MARBUT, IN CHARGE SOIL SURVEY

SOIL SURVEY
OHIO
STARK COUNTY SHEET

SOIL PROFILE
(3 feet deep)

Volusia loam — L
Chenango gravelly loam — Gl
Volusia gravelly clay loam — Gcl
Chenango silt loam — Sl
Volusia silt loam — Sil
Chenango sandy loam — Sl
Volusia silty clay loam — Sicl
Dekalb sandy loam — Sl
Volusia clay loam — Hsil to Cl
Dekalb silt loam — Sil
Wooster loam — Ll
Holston silt loam — Sil
Wooster gravelly loam — Gl
Huntington silt loam — Sl
Wooster sandy loam — Sl
Holly clay loam — Hsil to Sicl
Wooster silt loam — Sil
Papakating clay loam — Hl

LEGEND

L	Loam
Gcl	Gravelly clay loam
Cl	Clay loam
Gl	Gravelly loam
Sil	Silt loam
Hsil	Heavy silt loam
Sicl	Silty clay loam
C	Clay
Hl	Heavy loam
Ll	Light loam
Gs	Gravelly sand
Sl	Sandy loam
Sic	Silty clay
Ls	Loamy sand
Hcl	Heavy clay loam
G&S	Gravel and sand

FRANKLIN GREEN
LAKE
MARLB
LAWRENCE
JACKSON
PLAIN
VIMISHIL
TUSCARAWAS
PERRY
CANTON
OSNABU
SUGAR CREEK
BETHLEHEM
PIKE
SANDY
BR

W.E.McLendon, Inspector Northern Division
Soils surveyed by Charles N. Mooney of the U. S. Department of Agriculture, and H.F. Tuttle and A. Bonazzi of the Ohio Agricultural Experiment Station

BASE MAP FROM U.S. GEOLOGICAL SURVEY SHEETS

Scale 62500

ORTON LIB

[PUBLIC RESOLUTION—No. 9.]

JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]

Sketch map showing areas surveyed in Ohio.

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The Ohio State University
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SOIL SURVEY OF STARK COUNTY, OHIO

THE OHIO STATE UNIVERSITY BOOK DEPOSITORY
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